Mount Diablo Astronomical Society

Diablo MoonWatch

May 2012

General Meeting

Tuesday May 22, 2012

General Relativity for Everyone

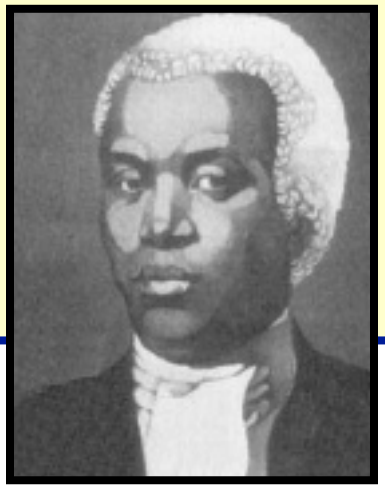
By Dr. Robert Piccioni

Doors open at 6:45 p.m.
Concord Police Association Facility
5060 Avila Road, Concord

Einstein's theory of General Relativity has been called the most beautiful creation of the human mind and the greatest scientific discovery ever made.

It is the foundation for understanding stars, galaxies, and the universe. Unfortunately, many people never get past the challenging mathematics of Einstein's theory. In this talk, we describe those mathematics and show that anyone who can cope with "2M/r" can understand spacetime curvature, time dilation, black holes, and the expansion of the universe. YOU CAN do this.

Robert graduated from Caltech, has a Ph.D. in high-energy physics from Stanford University, and was on the faculty of Harvard. Robert ran eight high-tech companies and holds patents in medical equipment, microelectronics, and smart energy. Since "retiring", his mission is making science accessible. Robert teaches at the Osher Institute at UCLA and Cal. State Channel Islands, where he was voted "Teacher of the Year". He is the author of three books that won national and international competitions and have the highest ratings in their categories on Amazon.com.



What's Up

Join me for an investigation of someone who was an Astronomer, but not only an Astronomer. He conceivably might also have been a hidden founding father who helped to design Washington D.C. Astronomer, surveyor, inventor, almanac maker, and student of the arts of mathematics, Benjamin Banneker was held in high esteem by Benjamin Franklin, George Washington, and the philosophers of the Enlightenment. What is particularly surprising was not so much Banneker's brilliance, since the eighteenth century was a time of brilliance. What is particularly surprising is that Banneker accomplished so much as an African-American in a slave society. Join me for a fascinating discussion of this colorful historical figure.

Nathaniel Bates

President's Corner

Watch This Space

by Chris Ford

This month I will speculate how the astronomically aware citizen might visually engage with the cosmos in future.

Anyone who is interested can now access astronomical imagery through the internet or traditional media. Those of us who desire to visually engage with the cosmos at a personal level can do so through our own telescopes or public outreach events and star parties. How though will the average citizen experience the cosmos at higher levels of visual fidelity than is currently possible, especially when in this financially austere age none of us will go there in person? The path to outer space for almost everyone in the foreseeable future lies through cyberspace. This is a mode of experiencing the cosmos that was not predicted in the early space age, but then the future never quite unfolds in the way that we anticipate.

Fortuitously, it is apparent that a convergence of technological trends in computing, media technology, telecommunications, and optics, could radically enhance the way both the dedicated amateur astronomer and the interested public will observe the cosmos in future.

The evolution of these trends could potentially democratize in a very profound way astronomical participation for everyone.

Sixty years ago, personal involvement with the cosmos at high levels of visual fidelity was only accessible to a few.

Commercial amateur telescopes were (relatively) small and expensive, home made instruments limited in their capabilities, and the observational experiences that we now associate with amateurs were only available to a few professional scientists in institutions. Radical advances in the technology of terrestrial visual observing for the average citizen were rarely speculated on.

In more recent decades, mass produced (cheap) optics from Asia supported by commodity electronics driven by the consumer market have become very price accessible to those of us with an active interest in astronomy. In parallel, the proliferation of media channels and above all the development of the internet, has meant that the public is increasingly exposed to astronomical imagery at a casual level, even if they do not actively seek it. None of this was anticipated 60-years ago.

It appears that the explosion of media channels is leading to a juxtaposition of expectations in which today's public increasingly expects more than the faint fuzzies traditionally observed through a telescope. The "YouTube" generation especially, is growing up with a set of visual expectations that is as much set by movies and games as it is by what can be seen by the eye. This is not to disparage the pleasures of traditional visual observing that remain a distinctive experience, but it is also true that access to enhanced levels of visual fidelity will require combinations of new technologies. Unfortunately, current imaging techniques are too slow, too expensive, or too inaccessible, for most members of the public.

So how can we transition to a new generation accustomed to more demanding visual expectations? How can we develop the tools with which to satisfy them?

Challenging a basic notion, today one does not need to even own a telescope to view the cosmos. With the development of computer controlled remote observatories, the cosmos can be accessed anywhere on Earth at any time of day, and often on far more elaborate and expensive equipment than any one individual could afford. Services like

Slooh Space Camera

Making CONTACT with the Ultimate Telescope *(Continued from the previous page)*

GRAS and Slooh are accessible now, actual telescopes you can drive remotely from the warmth of your house, or you can participate in scheduled programed observing events that you can log into. In fact, you don't even need a remote telescope. Tools like Google Sky, Mars, and Moon, or Microsoft's WorldWide Telescope Application enable anyone to browse the cosmos, albeit with previously acquired rather than live imagery. There is no live participation with the cosmos with these tools, but a wealth of data is immediately available.

None of this though is necessarily a stimulus for more members of the public to engage with the cosmos however. The willingness to take that interest has to be there as has been a means of notifying when something happens. One path to achieving this is to empower the devices that everyone now has. Most of you now have a camera continuously on your person - your cellphone. Personal electronics present enormous potential to connect the public directly to the cosmos. Astronomical applications and GPS make every cell phone into a mini-planetarium that can be updated continuously. Cell-phone to eye-piece adapters are now available for traditional telescopes, and more interestingly low cost cellphone camera lenses are entering the market that combined with image processing apps, and notifications to planetarium apps to provide pointing instructions, could be directed to image new astronomical occurrences in specific areas of the sky. The deployment of fast optical systems with faster exposure times and lower demands on mounting and pointing accuracy, will help facilitate this.

The sensors in cell phones are not yet designed for low light astronomical imaging and are limited in the quality of their output. In parallel, the marriage of consumer video sensors and simple optics is already producing through video-astronomy cameras such as the Mallincam, images of the sky that promise to be almost Hubble-like

Various cell-Phone optics adapters

in their quality. Often in just seconds, amazing results can be generated almost instantaneously. Heavy tracking mounts or large telescopes are not needed, and the output can be easily broadcast over the web to any local device. In particular High Definition (HD) imagery will soon far surpass the low broadcast quality of todays video astronomy cameras. The key is that these technologies are being driven by the economics of the consumer marketplace, placing capabilities before the public that are far more price accessible than the specialized low volume instruments of 60 years ago.

In association with the Internet, streamed live astronomical video content is already enabling virtual star parties, delivering live content from cameras on every continent.

Expanding on this capability, live viewing with the experts via Google+ on a scheduled basis can enable both amateurs and astronomy media professionals to intermix. Anyone can participate and no equipment is needed. Most importantly, everything is archivable on YouTube & Vimeo, accessible off-line.

The cloud is a particularly promising technological development that could move intensive image processing operations into the cloud and harness its vastly scalable computing resources at low cost. Ongoing developments in computational

Current generation video-image by Chris Bernardi

photography suggest that the actual characteristics of the astronomical image itself such as opti-

Making CONTACT with the Ultimate Telescope *(Continued from the previous page)*

cal seeing artifacts could be dynamically modified and perhaps removed. This still requires significant memory and computing power but through the cloud, this capability could be accessible anywhere where there is a Wifi link. We could be talking ultimately about instant observatory quality images accessible from your personal phone or tablet. These technologies have not fully converged now, but the foundations are already in place, the economics are falling into line, and there is no reason why this capability will not be accessible within this decade or next.

Virtual Star Party with MDAS member Stuart Forman.

All these developments just touch upon the way astronomy and the public could interact in future. It certainly appears a quite reasonable extrapolation of todays trends in computing, optics, and consumer electronics, that the next decade will see a combination of fast optics and HD Cameras delivering fast imaging of the sky in Hubble-like quality, with wireless imagery to tablet, large screen, or personal viewing devices with image processing in the cloud. Watch this space.

Chris Ford


Watch this space on your cellphone

Your Help Would Be Greatly Appreciated

Our association needs a few members to come at 6:30 p.m. before our monthly meeting which starts at 7:15 p.m. to help in seting up the chairs and other elements needed to conduct the general meeting.

Similarly at the end of each meeting the chairs and tables have to be removed, the room has to be cleaned and the garbage emptied.

Thank you for your help.

Why Humanity May Have to Leave The Solar System Sooner Than You Think!

By John A Read

Humanity will survive most of the challenges that nature will bring.

Over the next thousand years, we may have to deflect a giant asteroid or clear the atmosphere of sulfur from a giant volcanic eruption. We will endure solar flares and maybe even some supernova radiation. When humans finally colonize mars - in 300 years or so - we'll ride out year-long Martian sandstorms. When humans colonize Jupiter's moon Europa, we'll endure 8.0 magnitude ice quakes. And, when humans colonize Saturn's moon Titan, we'll deal with floods of liquid methane.

But someday, humanity will need to flee the solar system entirely.

One thing we know for sure is that there is a finite amount of energy in our solar system. When this energy begins to run out, everyone is going to have to pack up and move out. Otherwise, starved of energy, civilization will collapse, and consequently, most everyone will die. Some people say that humanity will always find more sources of energy. That might be true, but someday we'll need to go outside of our solar system to get it.

This essay will assume, for the foreseeable future, that the human population will continue to double around every fifty years, (this is loosely based on a high-end estimate from the UN). The essay will also assume that energy consumption will increase at approximately 5% each year (Wikipedia). At this rate, humanity will deplete the earth's supply of coal, crude oil and other fossil-fuels within 500 years (a very conservative estimate based on my own calculations). 200 years after that, the entire world supply of uranium and other metals used in nuclear power will also be depleted.

Let's begin at three hundred years in the future. With a human population in the hundreds of billions, most of the planet is covered in cities. There are no places on earth where you cannot see a high-rise building. This has forced humanity out into the solar system. Thanks to some excellent visionaries and engineers, living beyond earth is actually quite comfortable. The habitats mankind has constructed out in the Solar System are very nice.

Space based solar-collectors and power-transmitters beam energy to wherever it is needed. Humanity declares this the beginning of the "Age of Unlimited Energy." This energy is used to power the largest engineering projects in human history; including the colonization of every solid rock in the solar system.

At this point, there are three main areas where humanity consumes energy: transportation, food production, and terraforming.

With the explosion in human population and subsequent expansion into the solar system, transportation requires an unimaginable amount of energy. People traverse the solar system as easily as people use air travel back on earth. Humanity solved the problem of access to space by constructing a giant structure that extends beyond the earth's atmosphere; essentially an artificial mountain. From the top of this mountain, giant Space-Cruisers are

easily launched. The Space-Cruisers are powered by nuclear or fusion engines, no chemical propulsion is required.

Pluto is ten years away by 2012 standards, but now, high powered spacecraft can make the trip in little more than a few weeks. Even with fusion powered spacecraft, the most efficient power-source conceivable, large quantities of elements such as hydrogen and xenon are consumed by this process.

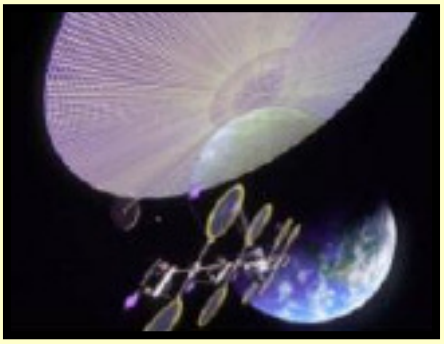
Producing food for hundreds of billions of people takes a substantial amount of energy, especially if these people are not living on earth. Food is grown in space on giant outposts located at favorable distances from the sun. Then, the food is delivered to the

Why Humanity May Have to Leave The Solar System Sooner Than You Think! (Continued from the previous page)

people living in deep space.

Terraforming occurs under glass bio-domes located on nearly every surface in the solar system. When the domed habitats were first constructed they were spaced out like water droplets. But now, they are joined together, making the entire surface of each world fully habitable. At these vast distances from the Sun, all of these worlds need a heat source. Simulated sunlight is beamed down daily from artificial suns, giant disks of light powered remotely by energy beamed from the real sun.

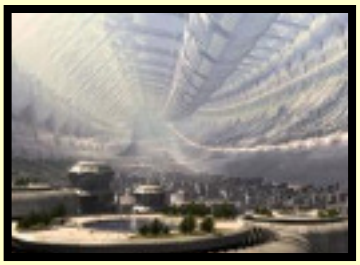
It is now one thousand years into our future. Like each generation before, most of humanity believes that there is an unlimited supply of energy. With a population in the trillions, humanity will be comprised of a civilization occupying all 84 large, hard surfaced bodies in the solar system. This includes every large moon (21 of them), giant asteroid (4 of them) and dwarf planet (all 51 of them!). Even Pluto is a city filled with people! It's not only planets and moons that house humanity; trillions more live on giant space stations. On these stations, artificial gravity is generated via rotation. The solar collectors have grown in number so much so that they act much like a partial Dyson-Sphere (A full Dyson-Sphere would cover the entire sun), but even with almost 90% of the Sun's energy being put to use, it's still not enough to meet humanities demand for energy. It is at this point that humanity begins to mine the sun!



The sun has plenty of potential energy. Humanity has constructed giant spacecraft that can fly through the sun's outermost layers, piercing it like an arrow, retrieving billions of tons of helium and hydrogen.

Giant factories have been constructed to process the elements of the sun, beaming out more and more energy to the hungry human colonies. Without a constant stream of energy, these outposts, with their trillions of people, would starve or freeze in a matter of weeks.

For many years the Sun-mining continues. The sun begins to warms up and expand as the fusion reaction in its core reacts to the reduction in the sun's overall mass.



To compensate for the expanding sun, humanity uses more energy than ever. They use this energy to adjust the orbits of the planets away from the expanding star. Giant fusion reactors power huge arrays of planet moving jets, hundred of jets mounted on towers all over the planet's surface. They call it, "Solar system engineering."

Mercury has been moved past the orbit of Venus and Earth has been moved past the orbit of mars.

But there is a problem! A problem that scientists warned about and a problem that engineers ignored. Like fossil fuels back on earth, there is only a limited supply of energy in the sun. What was initially supposed to last for 10 billion years, is now rapidly being depleted. "The Age of Unlimited Energy" is nearing it's end.

But still, the sun mining continues because there is no other viable energy source!

It's now 1700 years into our future and the amount of usable energy in the solar system is approaching zero. The Sun will soon grow to become a full sized red giant, and soon, it will blow off its outer layers and turn into a white dwarf. This white dwarf will support only a fraction of the human population. Some think that they will survive the transition. But this is not likely. The solar system must be evacuated!

Why Humanity May Have to Leave The Solar System Sooner Than You Think! *(Continued from the previous page)*

In preparing to leave the solar system, humanity plans for a drastic shift in energy consumption. Habitation and transportation systems are combined as people move from the planetary bodies onto giant spacecraft.

In preparation for departure, much of the sun's remaining energy is collected and used to create

antimatter, which will be stored and later used as a fuel source for the journey between the stars.

In the early days of "The Age of Unlimited Energy" a few millionaire adventure seekers set off for the stars. None have come back due to time debt, (Traveling at speeds approaching the speed of light allow for traveling great distances and time slows for the traveler relative to time as recorded by a stationary observer). A few of these adventurers have sent messages from the other solar systems with valuable information on the habitats of the local planets. Humanity has amassed a vast inventory of all the habitable exo-planets in this part of the galaxy. There is even a list of planets that have "some" form of life; forest, or ocean planets for example, populated with animals, trees and fish.

As the giant spacecrafts carrying billions of people leave the solar system, they head off in different directions, toward many different planetary systems. They'll do this for a variety of reasons, but mainly because there is no guarantee that an individual solar system will have enough planets or moons to support all of humanity.

Also, as humanity spends generations in between the stars, the human population continues to grow. Even though people aren't having as many children, medical science has progressed to the point that humans have become effectively immortal. Each new generation adds incrementally to the population.

Life between the stars:

All of the intergalactic vessels constructed for the journey were designed to form giant rings. Each of these structures holds billions of people and each ring is essentially its own city. From the "ground" level of one of these cities, you can look up and see the "sky," the projection of a summer's day complete with sunshine and puffy clouds.

In other cases, where multiple city-rings travel together, their ceilings are transparent. These cities share a "sun" with other nearby vessels. This sun is an artificially created fusion/antimatter reaction. This reaction is provided with enough fuel to burn for the duration of the journey.

Humanity travels in mass convoys. Some spacecraft are devoted entirely to food production, and others are devoted to animal transportation. Giant sphere shaped spacecraft contain what's left of earth's "ocean" with all the creatures therein.

And so it would be. For a length of time greater than recorded history, humanity will travel between the stars. But, when their journey ends, and they arrive at their new home planets, in distant solar systems, a new chapter in human history will have begun. Humanity will have become an intergalactic species.

And what if this energy apocalypse never happens?

What if human population growth slows and we never leave earth?

Then I guess we'll just have to wait, because over the next billion years, the sun will get hotter and hotter on it's own, and eventually, if we don't do anything about it, the earth's oceans will burn away, and the atmosphere will become thick with the gasses of a dying world.

Mount Diablo Astronomical Society Event Calendar–May 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	1	2	3	4	5 Sunset: 8:04 PM
6	7 Board Meeting (Private)	8 MDAS Imaging SIG (Private)	9 Sun telecon (Private)	10 8:00 PM Moraga Library Stargazing	11 8:00 PM Eagle Peak Stargazing	12 Observatory Maintenance (Private) Sunset: 8:10 PM
13	14	15 Antioch Middle School (Private)	16 Joaquin Moraga Intermedia (Private)	17	18	19 7:30 PM Public Astronomy Sunset: 8:17 PM
20 Annular Solar Eclipse	21 Dublin High Observing (Private)	22 7:15 PM GenMtg: Deeper Gen Rel	23	24 Oak Grove Stargazing (Private)	25 Walnut Acres Stargazing (Private)	26 Society Observing (Private) Sunset: 8:22 PM
27	28 Memorial Day	29	30	31	1	2

Last Chance to Place Your Order for The Official MDAS Jacket!

Jackets are embroidered on the back with our club name, includes an MDAS patch sewn on the front, and your first name embroidered on the front. The cost of the jacket is $55.00.

The order will be placed on May 15th, so reserve yours now:

http://www.mdas.net/mdas_store.html#MDAS_Jacket

You may also reserve your personalized jacket by sending an email to berendsen@aol.com or call Marni Berendsen at 925-930-7431. Be sure to tell us the size you want (M, L, XL, XXL) and the first name you want embroidered on the jacket.

You can bring a check for $55 made payable M.D.A.S. to the next meeting or send the check to this address:

Mount Diablo Astronomical Society
P.O. Box 4889
Walnut Creek, CA 94596

Wear your MDAS colors proudly to all our events!

Board Members & Address

President
Chris Ford - cford81@comcast.net

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Dick Flasck - rflasck@aol.com

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Observing Committee Chair, Board Member
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Nick Tsakoyias - claytonjandl@aol.com

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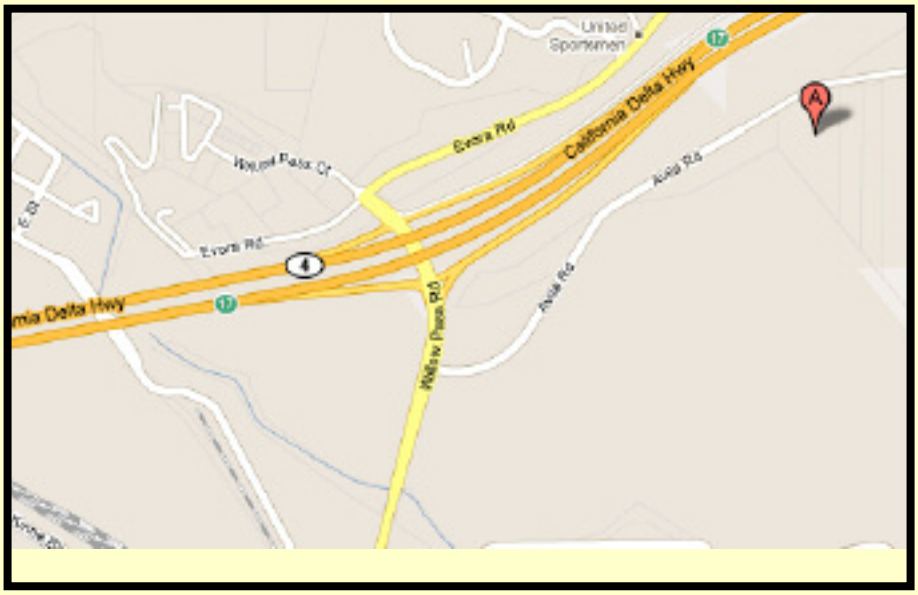
Walnut Creek, CA 94596-3754

General Meetings:
Fourth Tuesday every month, except on the third Tuesday in November and December. Refreshments and conversations Meetings begin at 7:15pm.

Where:
Concord Police Association
5060 Avila Road, Concord, CA 94596-3754

Directions to facility:
Avila Road is off Willow Pass Road. Turn east onto Avila Road approximately 300 yards south of the Willow Pass Road off-ramp from the Route 4 freeway. Turn right into the Police Association Facility at the crest of the first hill.



Community outreach for May and June 2012

The Venus Transit is June 5th. Come out and help us!

Thu 5/10 – 8 PM – Moraga Library -Stargazing, Moraga

Fri 5/11 – 8 PM – Eagle Peak Montessori School -Stargazing, Walnut Creek

Tue 5/15 – 8:15 PM – Antioch Middle School -Stargazing, Antioch

Wed 5/16 – 7:45 PM – Joaquin Moraga Intermediate -Starparty, Moraga

Sat 5/19 – 8 PM – Mt. Diablo Public Night, Lower Summit Parking Lot

Sun 5/20 – 5 PM to 7:45 PM – Partial Solar Eclipse Viewing, Lower Summit Parking Lot

Mon 5/21 – 8:15 PM – Dublin High School -Stargazing, Dublin

Thu 5/24 – 8:30 PM – Oak Grove Middle School -Stargazing, Concord

Fri 5/25 – 8:30 PM – Walnut Acres Elementary -Stargazing, Walnut Creek

Tue 6/5 – 2 PM to 9 PM – Venus Transit Viewing, Juniper Campground, Mount Diablo State Park

Tue 6/5 – 2 PM to 7 PM – Venus Transit Viewing, East Bay Parks Shadow Cliffs, Pleasanton

Tue 6/5 – 3 PM to 8 PM – Lafayette Library Venus Transit Viewing, Lafayette

Check our website for setup times and directions.